

Appl. No. 09/944,066
Amdt. Dated August 6, 2003
Reply to Office Action of July 7, 2003

AMENDMENTS TO THE CLAIMS

Claim 1 (Original): A system comprising:

a first layer of fabric including therein at least one fiber of a first type having a tensile breaking strength of at least about 10g/Denier; and

a second layer, at least partially coextensive with the first layer comprising a microporous membrane.

Claims 2-5 have been cancelled.

Claim 6 (Original): The system as in claim 1, wherein the fiber of the first type is formed of a material selected from the group consisting of: para-aramids; liquid crystal polyesters; ultra-high molecular weight polyethylenes; and poly(p-phenylene-2,6-benzobisoxazole) (PBO).

Claim 7 (Original): The system as in claim 1, wherein the first layer consists essentially of fibers having a tensile breaking strength of at least about 10 g/Denier.

Claim 8 (Original): The system as in claim 1, wherein the first layer comprises a woven fabric having a fill yarn cover of at least about 75% and warp yarn cover factor of at least about 100%.

Claim 9 (Original): The system as in claim 8, further comprising:
a third layer of at least partially coextensive with the first and second layers.

Claim 10 (Original): The system as in claim 9, wherein the third layer comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns, with a fill yarn cover factor of less than about 75% and a warp yarn cover factor of less than about 100%.

Claim 11 (Original): The system as in claim 10, wherein the third layer includes therein at least one fiber of a second type a tensile breaking strength of less than about 10 g/Denier.

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Claim 12 (Original): The system as in claim 11, wherein the fiber of the second type is formed of a material selected from the group consisting of: polyamides; cellulosic materials; polyesters; acrylic polymers; and polyolefins.

Claim 13 (Original): The system as in claim 11, wherein the third layer includes therein at least one yarn having a weight per unit length of between about 20 Denier and about 70 Denier.

Claim 14 (Original): The system as in claim 11, wherein the first layer comprises a woven fabric comprising a plurality of fill yarns and a plurality of warp yarns, wherein the fill yarns have a weight per unit length of a first value and the warp yarns have a weight per unit length of a second value that is greater than the first value.

Claim 15 (Original): The system as in claim 9, wherein the second layer is disposed between the first layer and the third layer.

Claim 16 (Original): The system as in claim 15, wherein the second layer comprises an adhesive coating attached to at least one of the first and third layer.

Claim 17 (Original): The system as in claim 16, wherein the second layer is attached to both the first layer and third layer, thereby securing the first layer to the third layer.

Claim 18 (Original): The system as in claim 16, wherein the adhesive coating is formed of a material selected from the group consisting of: urethane adhesives and acrylic latex adhesives.

Claim 19 (Original): The system as in claim 9, wherein the first layer comprises a felted fabric.

Claim 20 (Original): The system as in claim 19, wherein the second layer is disposed between the first layer and the third layer.

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Claim 21 (Original): The system as in claim 9, wherein the first layer is disposed between the second layer and the third layer.

Claim 22 (Original): The system as in claim 21, further comprising:
a fourth layer at least partially coextensive with the first, second, and third layers and disposed directly adjacent to the second layer.

Claim 23 (Original): The system as in claim 1, wherein the second layer comprises a coating adhered to at least a portion of a surface of the first layer.

Claim 24 (Original): The system as in claim 23, wherein the coating comprises a polymeric material having a modulus of elasticity of less than about 100,000 psi.

Claims 25-28 have been cancelled.

Claim 29 (Original): The system as in claim 23, wherein the coating comprises a conformal coating on the surface.

Claim 30 (Original): The system as in claim 23, wherein the coating is permeable to water vapor but is substantially impermeable to liquid water.

Claim 31 (Original): The system as in claim 23, wherein the coating comprises a hydrophobic polymeric material.

Claim 32 (Original): The system as in claim 1, wherein the second layer comprises a separable layer that is not attached to the first layer.

Claim 33 (Original): The system as in claim 1, wherein the second layer is attached to the first layer.

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Claim 34 (Original): The system as in claim 33, wherein the second layer is attached to the first layer by an adhesive.

Claim 35 (Original): The system as in claim 34, wherein the adhesive comprises a material selected from the group consisting of: polyurethanes; acrylic polymers; and poly(vinyl chloride).

Claim 36 (Original): The system as in claim 33, wherein the second layer is attached to the first layer by thermal bonding.

Claim 37 (Original): The system as in claim 1, wherein the second layer comprises a hydrophobic membrane.

Claim 38 (Original): The system as in claim 37, wherein the hydrophobic membrane is formed from a material selected from the group consisting of: poly(tetrafluoroethylene); polyolefins; polyurethanes; and foamed neoprene rubber.

Claim 39 (Original): The system as in claim 37, wherein the membrane is permeable to water vapor but is substantially impermeable to liquid water.

Claim 40 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 1.

Claim 41 (Withdrawn): The article of apparel as in claim 40, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 42 (Withdrawn): The article of apparel as in claim 41, wherein the first layer is configured and positioned to form an outer surface of the article of apparel.

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Claim 43 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 9.

Claim 44 (Withdrawn): The article of apparel as in claim 43, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 45 (Withdrawn): The article of apparel as in claim 44, wherein the first layer is configured and positioned to form an outer surface of the article of apparel.

Claim 46 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 22.

Claim 47 (Withdrawn): The article of apparel as in claim 46, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 48 (Withdrawn): The article of apparel as in claim 47, wherein the third layer is configured and positioned to form an outer surface of the article of apparel and the fourth layer is configured and positioned to form an inner liner surface of the article of apparel.

Claim 49 (Withdrawn): A method comprising the step of:
combining a first layer of fabric including therein at least one high tenacity fibers having a tensile breaking strength of at least about 10g/Denier with a second layer comprising a microporous membrane, such that the second layer is at least partially coextensive with the first layer.

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Claim 50 (Withdrawn): The method as in claim 49, wherein the combining step comprises coating the first layer with a liquid and allowing the liquid to harden to form the second layer.

Claim 51 (Withdrawn): The method as in claim 50, wherein the liquid is conformally coated onto the first layer.

Claim 52 (Withdrawn): The method as in claim 50, wherein the liquid hardens to form the second layer by solvent evaporation.

Claim 53 (Withdrawn): The method as in claim 52, wherein a rate of solvent evaporation is controlled so as to form a plurality of micropores in the second layer.

Claim 54 (Withdrawn): The method as in claim 53, wherein the second layer is rendered permeable to water vapor but substantially impermeable to liquid water.

Claim 55 (Withdrawn): The method as in claim 50, wherein the second layer is disposed on the first layer at a thickness corresponding to a specific weight of the second layer of no greater than about 1 ounce per square yard.

Claim 56 (Withdrawn): The method as in claim 55, wherein the second layer is disposed on the first layer at a thickness corresponding to a specific weight of the second layer of no greater than about 0.25 ounce per square yard.

Claim 57 (Withdrawn): The method as in claim 49, wherein the combining step comprises:
providing the microporous membrane; and
layering the membrane with first layer so that it is at least partially coextensive with the first layer.

Claim 58 (Withdrawn): The method as in claim 57, further comprising:

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attaching the microporous membrane to the first layer.

Claim 59 (Withdrawn): The method as in claim 58, wherein the attaching step comprises thermal bonding.

Claim 60 (Withdrawn): The method as in claim 58, wherein the attaching step comprises applying an adhesive between the microporous membrane and the first layer.

Claim 61 (Original): A system comprising:

a first layer of high cover factor woven fabric formed of a plurality of fill yarns and plurality of warp yarns and having a fill yarn cover factor of at least about 75% and warp yarn cover factor of at least about 100%; and

a second layer of fabric, at least partially cocxtensive with the first layer, comprising a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns and having a fill yarn cover factor of less than about 75% and a warp yarn cover factor of less than about 100% where the system is flexible and drapable.

Claim 62 (Original): The system as in claim 61, wherein the first layer includes at least one fiber of a first type having a tensile breaking strength of at least about 10 g/Denier.

Claims 63-66 have been cancelled.

Claim 67 (Original): The system as in claim 62, wherein the fiber of the first type is formed of a material selected from the group consisting of: para-aramids; liquid crystal polyesters; ultra-high molecular weight polyethylenes; and poly(p-phenylene-2,6-benzobisoxazole) (PBO).

Claim 68 (Original): The system as in claim 62, wherein the first layer consists essentially of fibers having a tensile breaking strength of at least about 10 g/Denier.

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Claim 69 (Original): The system as in claim 61, wherein at least one yarn forming the fabric of the first layer comprises a plurality of fibers including a fiber of a first type having a tensile breaking strength of at least about 10 g/Denier and a fiber of a second type having a tensile breaking strength of less than 10 g/Denier.

Claim 70 (Original): The system as in claim 69, wherein the yarn comprises a plied yarn formed from at least a first fiber bundle and a second fiber bundle plied together and wherein the first fiber bundle comprises the fiber of the first type and the second fiber bundle comprises the fiber of the second type.

Claim 71 (Original): The system as in claim 70, wherein the first fiber bundle consists essentially of fibers having a tensile breaking strength of at least about 10 g/Denier and the second fiber bundle consists essentially of fibers having a tensile breaking strength of less than about 10 g/Denier.

Claim 72. (Original): The system as in claim 70, wherein the plied yarn is characterized by a secondary ply twist of at least about $\frac{1}{4}$ that of a primary twist of the first fiber bundle and the second fiber bundle.

Claim 73 (Original): The system as in claim 69, wherein the yarn comprises a fiber bundle including the fiber of the first type and the fiber of the second type.

Claim 74 (Original): The system as in claim 73, wherein the fiber bundle comprises a plurality of spun staple fibers.

Claim 75 (Original): The system as in claim 74, wherein the fiber bundle had a primary twist multiplier of at least about 2.7.

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Claim 76 (Original): The system as in claim 74, wherein the any given cross-section of the fiber bundle along its length includes therein between about 60 and about 100 fibers.

Claim 77 (Original): The system as in claim 61, wherein at least one of the first layer and the second layer each of the plurality of fill yarns has a weight per unit length of a first value and each of the plurality of warp yarns has a weight per unit length of a second value that exceeds the first value.

Claim 78 (Original): The system as in claim 61, wherein the fabric of the first layer has a fill yarn cover factor of at least about 80%.

Claim 79-80 have been cancelled.

Claim 81 (Original): The system as in claim 61, wherein the fabric of the first layer has a warp yarn cover factor of at least about 110%.

Claims 82-86 have been cancelled.

Claim 87 (Original) The system as in claim 61, wherein the second layer includes at least one fiber having a tensile breaking strength of less than about 10 g/Denier.

Claims 88-90 have been cancelled.

Claim 91 (Original): The system as in claim 87, wherein the fiber is formed of a material selected from the group consisting of: polyamides; cellulosic materials; polyesters; acrylic polymers; and polyolefins.

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Claim 92 (Original): The system as in claim 61, wherein the fabric of the second layer has a fill yarn cover factor less than about 70%.

Claims 93-95 have been cancelled.

Claim 96 (Original): The system as in claim 6, wherein the fabric of the second layer has a warp yarn cover factor less than about 90%.

Claim 97-99 have been cancelled.

Claim 100 (Original): The system as in claim 61, wherein each of the plurality of yarns forming the second layer of fabric has a weight per unit length of between about 20 Denier and about 70 Denier.

Claims 101-106 have been cancelled.

Claim 107 (Original): The system as in claim 61, further comprising:
a third layer that is at least partially coextensive with the first and second layers.

Claim 108 (Original): The system as in claim 107, wherein the first layer is disposed between the second layer and the third layer.

Claim 109 (Original): The system as in claim 107, wherein the third layer comprises fibers having a tensile breaking strength of less than about 10 g/Denier.

Claim 110 (Original): The system as in claim 107, wherein third layer is a fabric.

Claim 111 (Original): The system as in claim 110, wherein third layer is woven fabric.

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Claim 112 (Original): The system as in claim 110, wherein third layer is a non-woven fabric.

Claim 113 (Original): The system as in claim 110, wherein third layer comprises a random fabric web needled into and through the first and second layers.

Claim 114 (Original): The system as in claim 113, wherein third layer comprises fibers having a tensile breaking strength of at least about 10 g/Denier.

Claim 115 (Original): The system as in claim 113, wherein third layer comprises fibers having a tensile breaking strength of less than about 10 g/Denier.

Claim 116 (Original): The system as in claim 107, further comprising:
a fourth layer that is at least partially coextensive with the first, second, and third layers.

Claim 117 (Original): The system as in claim 116, wherein the first layer forms an intermediate layer.

Claim 118 (Original): The system as in claim 61, wherein the abrasion resistance of the second layer is greater than the abrasion resistance of the first layer.

Claim 119 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 61.

Claim 120 (Withdrawn): An article of apparel as in claim 119, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

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Claim 121 (Original): A system comprising:

a first layer of a felted fabric including therein at least one fiber of a first type having a tensile breaking strength of at least about 10 g/Denier; and
a second layer of a fabric at least partially coextensive with the first layer.

Claims 122-125 have been cancelled.

Claim 126 (Original): The article as in claim 121, wherein the fiber of the first type is formed of a material selected from the group consisting of: para-aramids; liquid crystal polyesters; ultra-high molecular weight polyethylenes; and poly(p-phenylene-2,6-benzobisoxazole) (PBO).

Claim 127 (Original): The system as in claim 121, wherein the felted fabric consists essentially of fibers of having a tensile breaking strength of at least about 10 g/Denier.

Claim 128 (Original): The system as in claim 121, wherein the felted fabric has a weight, not including and coating or other materials applied thereto, of between about 3 ounces per square yard and about 10 ounces per square yard.

Claim 129 (Original): The system as in claim 121, wherein the felted fabric has a bulk density, not including and coatings or other materials applied thereto, of at least about 0.3 g/cm³.

Claims 130-131 have been cancelled.

Claim 132 (Original): The system as in claim 121, wherein the thickness of the felted fabric is between about 0.012 inch and about 0.2 inch.

Claims 133-134 have been cancelled.

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Claim 135 (Original): The system as in claim 121, wherein the second layer of fabric consists essentially of fibers having tensile breaking strength of less than about 10 g/Denier.

Claim 136 (Original): The system as in claim 135, wherein the second layer of fabric consists essentially of fibers formed of a material selected from the group consisting of: polyamides; cellulosic materials; polyesters; acrylic polymers; and polyolefins.

Claim 137 (Original): The system as in claim 135, wherein the second layer of fabric comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns and having a fill cover factor of less than about 75% and a warp yarn cover factor of less than about 100%.

Claim 138 (Original): The system as in claim 137, wherein each of the plurality of yarns forming the second layer of fabric has a weight per unit length of between about 20 Denier and about 70 Denier.

Claim 139 (Original): The system as in claim 135, wherein the second layer of fabric is attached to the first layer.

Claim 140 (Original): The system as in claim 135, further comprising a third layer of fabric that is at least partially coextensive with the first and second layers.

Claim 141 (Original): The system as in claim 140, wherein the first layer is disposed between the second layer and the third layer.

Claim 142 (Original): The system as in claim 141, wherein the first layer is attached to both the second and the third layers.

Claim 143 (Original): The system as in claim 140, wherein the third layer of fabric consists essentially of fibers having a tensile breaking strength of less than about 10 g/Denier.

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Claim 144 (Original): The system as in claim 143, the third layer of fabric comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns and having a fill cover factor of less than 75% and a combined warp yarn cover factor of less than about 100%.

Claim 145 (Original): The system as in claim 144, wherein each of the plurality of yarns forming the second layer of fabric has a weight per unit length of between about 20 Denier and about 70 Denier.

Claim 146 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 121.

Claim 147 (Withdrawn): The article of apparel as in claim 146, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 148 (Withdrawn): A method comprising the step of:
combining a first layer of felted fabric including therein at least one fiber of a first type having a tensile breaking strength of at least about 10g/Denier with a second layer of a fabric so that the second layer is at least partially coextensive with the first layer.

Claim 149 (Withdrawn): The method as in claim 148, wherein the combining step comprises layering without attaching the first layer to the second layer.

Claim 150 (Withdrawn): The method as in claim 148, wherein the combining step comprises layering and attaching the first layer to the second layer.

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Claim 151 (Withdrawn): The method as in claim 150, wherein the first layer is attached to the second layer by needling.

Claim 152 (Withdrawn): The method as in claim 150, wherein the first layer is attached to the second layer by an adhesive.

Claim 153 (Withdrawn): The method as in claim 152, wherein the first layer is attached to the second layer by disposing an essentially continuous layer of an adhesive between the first and the second layers.

Claim 154 (Withdrawn): The method as in claim 148, further comprising the step of:
forming the felted fabric.

Claim 155 (Withdrawn): The method as in claim 154, further comprising consolidating the felted fabric to increase its density.

Claim 156 (Withdrawn): The method as in claim 155, wherein the felted fabric is consolidated by bonding fibers within the felted fabric together with a sizing agent.

Claim 157 (Withdrawn): The method as in claim 155, wherein the felted fabric is consolidated by entangling the fibers within the felted fabric by a needling process.

Claim 158 (Original): A system comprising:

a first layer of a fabric consisting essentially of fibers of having a tensile breaking strength less than about 10g/Denier, the fibers being formed of a material selected from the group consisting of: nylon; cotton; polyester; acrylic polymers; and polyolefins; and mixtures thereof; and

a second layer of fabric, at least partially coextensive with the first layer, including therein at least one fiber of having a tensile breaking strength of at least about 10g/Denier.

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Claims 159-161 have been cancelled.

Claim 162 (Original): The system as in claim 158, wherein the second layer consists essentially of fibers having a tensile breaking strength of at least about 10g/Denier.

Claim 163 (Original): The system as in claim 158, wherein the second layer comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns.

Claim 164 (Original): The system as in claim 163, wherein the woven fabric comprising the second layer has a fill yarn cover factor of at least about 75% and a warp yarn cover factor of at least about 100%.

Claim 165 (Original): The system as in claim 163, wherein the first layer and the second layer are attached to each other.

Claim 166 (Original): The system as in claim 163, further comprising:
a third layer that is at least partially coextensive with the first and second layers.

Claim 167 (Original): The system as in claim 166, wherein the second layer is disposed between the first layer and the third layer.

Claim 168 (Original): The system as in claim 166, wherein the third layer comprises a fabric.

Claim 169 (Original): The system as in claim 168, wherein the third layer consists essentially of fibers of having a tensile breaking strength less than about 10g/Denier.

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Claim 170 (Original): The system as in claim 168, wherein the third layer comprises a woven fabric.

Claim 171 (Original): The system as in claim 166, wherein the second layer is attached to both the first layer and the third layer.

Claim 172 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 158.

Claim 173 (Withdrawn): The article of apparel as in claim 172, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 174 (Original): A system comprising:

a first layer of a woven fabric formed of a plurality of fill yarns, having a weight per unit length of a first value, and a plurality of warp yarns, having a weight per unit length of second value greater than the first value; and

a second layer that is at least partially coextensive with the first layer.

Claim 175 (Original): The system as in claim 174, wherein the first layer includes therein at least one fiber of a first type having a tensile breaking strength of at least about 10g/Denier.

Claim 176 (Original): The system as in claim 175, wherein the fiber of the first type is formed of a material selected from the group consisting of: para-aramids; liquid crystal polyesters; ultra-high molecular weight polyethylenes; and poly(p-phenylene-2,6-benzobisoxazole) (PBO).

Claim 177 (Original): The system as in claim 175, wherein the first layer consists essentially of fibers having a tensile breaking strength of at least about 10g/Denier.

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Claim 178 (Original): The system as in claim 174, wherein the woven fabric comprising the first layer has a fill yarn cover factor of at least about 75% and a warp yarn cover factor of at least about 100%.

Claim 179 (Original): The system as in claim 174, wherein the second layer comprises a fabric.

Claim 180 (Original): The system as in claim 179, wherein the second layer comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns.

Claim 181 (Original): The system as in claim 180, wherein the second layer consists essentially of fiber having a tensile breaking strength of less than about 10g/Denier.

Claim 182 (Original): The system as in claim 180, wherein the woven fabric comprising the second layer has a fill yarn cover factor of less than about 75% and a warp yarn cover factor of less than about 100%.

Claim 183 (Original): The system as in claim 182, wherein each of the plurality of yarns forming the second layer of fabric has a weight per unit length of between about 20 Denier and about 70 Denier.

Claim 184 (Original): The system as in claim 179, wherein the first layer and the second layer are attached to each other.

Claim 185 (Original): The system as in claim 174, further comprising:
a third layer that is at least partially coextensive with the first and second layers.

Claim 186 (Original): The system as in claim 185, wherein the first layer is disposed between the second layer and the third layer.

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Claim 187 (Original): The system as in claim 186, wherein the first layer is attached to both the first and third layers.

Claim 188 (Original): The system as in claim 186, wherein the third layer comprises a woven fabric formed of a plurality of fill yarns and a plurality of warp yarns.

Claim 189 (Original): The system as in claim 188, wherein the third layer consists essentially of fibers having a tensile breaking strength of less than about 10g/Denier.

Claim 190 (Original): The system as in claim 188, wherein the woven fabric comprising the third layer has a fill yarn cover factor of less than about 75% and a warp yarn cover factor of less than about 100%.

Claim 191 (Withdrawn): An article of apparel formed, at least in part, from the system as recited in claim 174.

Claim 192 (Withdrawn): The article of apparel as in claim 191, wherein the article of apparel is selected from the group consisting of: gloves; aprons; chaps; pants; boots; gators; shirts; jackets; coats; socks; shoes; undergarments; vests; waders; hats; and gauntlets.

Claim 193 (Previously Presented): The system as in claim 78, wherein the fabric of the first layer has a fill yarn cover factor of at least about 88%.

Claim 194 (Previously Presented): The system as in claim 81, wherein the fabric of the first layer has a warp yarn cover factor of at least about 150%.

Claim 195 (Previously Presented): The system as in claim 61, wherein the first layer is attached to the second layer by an adhesive.

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Claim 196 (Previously Presented): The system as in claim 61, wherein the first layer is attached to the second layer by a double-beam partial interweave of the first and second layers.

Claim 197 (Previously Presented): The system as in claim 61, wherein the first layer is attached to the second layer by needle entangling.

Claim 198 (Previously Presented): The system as in claim 61, wherein the first layer is attached to the second layer by hydro-entangling.

Claim 199 (Previously Presented): The system as in claim 132, wherein the thickness of the felted fabric is between about 0.015 inch and about 0.05 inch.